IN THE SPECIFICATION

Please replace the paragraph on Page 1, starting on line 1 with the following:

Background of the Invention

The invention relates to a starting-process controller

- having a voltage-controlled oscillator (VCO), a power output stage, and a resonance converter, wherein
- the voltage-controlled oscillator (VCO) generates the control signals required for the power output stage,
- the resonance converter converts the stepped output voltage from the power output stage into a sinusoidal voltage at its output,
- the piezomotor is driven by the sinusoidal voltage from the resonance converter,
- the motor current that flows when the piezomotor is driven is measured and compared with the phase of the drive voltage in a phase comparator,
- the output signal from the phase comparator is a measure for the phase difference at the time between current and voltage,
- a phase-locked loop filter smoothes the phase-difference signal,
- the smoothed signal controls the oscillator (VCO).

Please replace the paragraph on Page 2, starting on line 6 with the following:

Summary of the Invention

It is an object of the invention to ensure a stable and reliable starting under different loads.

Please replace the paragraph on Page 3, starting on line 5 with the following:

Brief Description of the Drawings

Fig. 1 is a block circuit diagram of the first embodiment in which, to start the motor, use is made of a starting-process circuit that feeds an assured voltage to a process frequency-generator by means of a starting-value presetting circuit and a phase-locked loop filter,

Please replace the paragraph on Page 3, starting on line 23 with the following:

Detailed Description of the Invention

Shown in Fig. 1 is a first embodiment of the starting-process controller for starting a piezomotor, the controller having a voltage-controlled oscillator 1 (VCO), a power output stage 2, and a resonance converter 3. The resonance converter 3 converts a stepped output voltage from the power output stage 2 into a sinusoidal voltage at the output of the resonance converter 3. The oscillator 1 (VCO) generates the control signals required for the power output stage 2. The piezomotor 4 is driven by the sinusoidal voltage from the resonance converter. The motor current i_k that flows in a line 5 when this is done is measured. The value i_k of the current is compared in a phase comparator 6 with the phase of the drive voltage u_d on a line 7. The output signal s_1 from the phase comparator 6 on a line 7a is a measure for the phase difference at the time between current and voltage. A phase-locked loop filter 8 smoothes the phase-difference signal, and the smoothed signal controls the oscillator 1 (VCO).

Please replace the paragraph on Page 4, starting on line 14 with the following:

The starting-value presetting circuit 9 generally comprises a resistor R_c and a voltage source U_c. The voltage from the voltage source U_c is selected such that, at it, the oscillator 1 generates the optimum breakaway frequency. The resistance of the resistor R_c is selected such that it is far smaller than the output impedance of the phase comparator 6. The construction of the loop filter 8 and its dimensioning are described in the conventional data sheets for PLL modules. The start-assisting switching element 10 comprises the starting-value presetting circuit 9, and a switching element 10a that is responsible for connecting the starting-value presetting circuit 9 to the loop filter 8. In the simplest version, a resistor $\cancel{R_F}$ $\underline{R_R}$ alone (Fig. 1) may be connected in parallel with the loop filter 8.

Please replace the paragraph on Page 4, starting on line 30 with the following:

The second embodiment of the invention operates with a phase-shifting arrangement. This starting-process controller, which is shown in Fig. 3, once again employs a voltage-controlled oscillator 1 (VCO), a power output stage 2, and a resonance converter 3 for starting the piezomotor 4. The resonance converter 3 converts the stepped output voltage from the power output stage 2 into a sinusoidal voltage at the output of the resonance converter 3. An essential part of the present embodiment is an adjustable ~~time-delay element~~ timer 15, a time-delay element by which the phase angle between the voltage applied to the motor and the motor current is changed in start-up operation from an initially large starting angle for safe and reliable breakaway towards a smaller

angle at the operating point, so that start-up will be completed safely and reliably irrespective of the loading condition.

Please replace the paragraph on Page 5, starting on line 6 with the following:

The oscillator 1 generates the requisite control signals for the power output stage 2. The piezomotor 4 is driven by the sinusoidal voltage from the resonance converter 3. The motor current i_s that flows when this is done is measured. The current value phase-shifted by the adjustable, programmable ~~delay element~~ timer 15 is compared in the phase comparator 6 with the phase of the drive voltage. The delay preset for the ~~time-delay element~~ timer 15 is supplied by the starting-process controller 11.2. The output signal from the phase comparator 6 is a measure for the phase difference at the time between current and voltage. The loop filter 8 smoothes the phase-difference signal, and the smoothed signal controls the oscillator 1.

Please replace the paragraph on Page 5, starting on line 18 with the following:

In Fig. 5, two start-up curves are shown by way of example for the preset angle against time. ~~Curve~~ c1 shows a linear gradient. There is a danger in this case that the change of angle (angular increment) will be too fast in the load region that is critical (near the operating point). ~~Curve~~ c2 follows a path that overcomes the problem described above. Close to the target angle defined, the changes set for the phase angle per increment of time become smaller. Also, because of the progressive curve followed by the angular value that is preset, operation at high efficiency is achieved more quickly in the initial start-up phase. The reduction in phase-angle during start-up may be in the form of a ramp.

Similarly, the reduction in phase-angle during the start-up process may be effected by means of a digital counter 15a. The value from which the counter starts advantageously defines the phase angle in this case. It is also possible for the starting process to be determined by means of the counter. The starting process may also be determined by means of a counter 11a.

Please replace the paragraph on Page 5, starting on line 30 with the following:

Fig. 6 shows, by way of example, a circuit that produces the form of ~~curve~~ c1 shown in Fig. 5. The left-hand half of the Figure shows the starting-process controller 11.3 and the right-hand half shows the programmable delay element 15. Forming part of the starting-process controller 11.3 is a binary counter 11a, having a clock-signal input 11b to which a signal of a frequency f_{res} equal to the VCO frequency is fed via a line 21. Provided therebelow is the binary counter 11a, to which a φ-start signal is fed via a line 22 and a start signal via a line 23. Forming part of the programmable ~~delay element~~ timer 15 is a counter 15a having a clock-signal input 15b.

Please replace the paragraph on Page 6, starting on line 16, with the following:

The counter 15a in the programmable ~~delay element~~ timer 15 is started when the current signal s_s passes through zero. This is done by setting it to the preset value supplied by the starting-process controller 11.3. Starting from this value, the counter 15a counts down until it stops at a count of "0". This process is repeated each time the motor current passes through zero. The output signal s_a from the ~~delay element~~ timer 15 acts as a stopping signal s_o for counter 15a. This achieves that the signal for the

passage through zero of the motor current is passed on with a delay. The preset clock frequency s_i for the delay element 15 is supplied by, for example, a quartz oscillator.

Please replace the paragraph on Page 6, starting on line 24 with the following:

Fig. 7 shows, by way of example, a circuit that produces the form of curve 2 shown in Fig. 5. The left-hand half of the Figure shows the starting-process controller 11.4 and the right-hand half shows the programmable ~~delay element~~ timer 15, to which there is no change as compared with Fig 6. Forming part of the starting-process controller 11.4 is a binary counter 11a having a clock-signal input 11b. A signal of a frequency f_{res} equal to the VCO frequency is fed to the clock-signal input 11b via a line 21. A φ-start signal is fed to binary counter 11a via a line 22 and a start signal is fed to it via a line 23. Also shown is a value table 16. Forming part of the programmable ~~delay element~~ timer 15 is a counter 15a having a clock-signal input 15b.

Please replace the paragraph on page 6, starting on line 33 with the following:

The counter 11a in the starting-process controller 11.4 has a timing interval that can be preset at a fixed value. It starts from a given value that represents the number of values in the value table 16. Starting from this value, counter 11a counts down, for example, until it stops at a count of "0". This means that in each starting process, counter 11a counts once from the preset starting value to the final count of "0". By means of the table 16, the counts are converted into settings for the phase delay in a memory device (RAM or ROM). Stored in the value table 16 are the individual binary values that the ~~delay element~~ timer 15

needs for the desired phase shifts. The first value represents the phase shift that allows safe and reliable start-up. The start-up process is advantageously monitored in this case by a programmable control device, such as a microprocessor (not shown) or a DSP. The processor can monitor the phase delay digitally. The final value for the phase shift is so selected that an optimum operating angle is set.

Please replace the paragraph on page 7, starting on line 17 with the following:

The preset clock frequency s_i for the ~~delay element~~ timer 15 is supplied by, for example, a quartz oscillator.